Some fruits and other fragments from the Belly River series appear to indicate the presence of a species of *Podocarpus.* Appended to the descriptions of the woods are notices of new species and localities in connexion with the Laramie flora, and remarks on the grand coniferous fruits of the period, as connected with the formation of coal and lignite. The concluding remarks are given in full, as of interest in connexion with the British Eocene flora :—

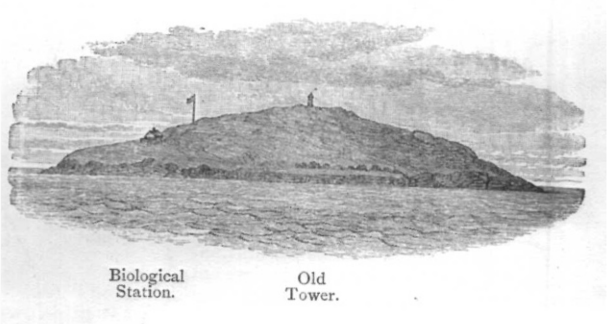
Concluding Remarks.—While studying the specimens described in this paper, I received the volume of the Palæontographical Society for 1885, containing the conclusion of Mr. Starkie Gardner's description of the Eocene Coniferæ of England. The work which he has been able to do in disentangling the nomenclature of these plants, and fixing their geological age, is of the greatest value, and shows how liable the palæobotanist is to fall into error in determining species from imperfect specimens. Our American species no doubt require some revision in this respect.

I have also, while writing out the above notes for publication, received the paper of the same author on the Eocene beds of Ardtun in Mull, and am fully confirmed thereby in the opinion derived from the papers of the Duke of Argyll and the late Prof. E. Forbes (Journ. Geol. Soc. of London, vol. vii.), that the Mull beds very closely correspond in age with our Laramie. The *Filicites hebridica* of Forbes is our *Onoclea sensibilis.* The species of *Gingko, Taxus, Sequoia,* and *Glyptostrobus* correspond, and we have now probably found a *Podocarpus* as noted above. The *Platanites hebridicus* is very near to our great *Platanus nobilis. Corylus Macquarii* is common to both formations, as well as *Populus arctica* and *P. Richardsoni,* while many of the other exogens are generically the same, and very closely allied. These Ardtun beds are regarded by Mr. Gardner as Lower Eocene, or a little older than the Gelinden series of Saporta, and nearly of the same age with the so-called Miocene of Atanekerdluk in Greenland. I have ever since 1875 maintained the Lower Eocene age of our Laramie, and of the Fort Union group of the North-Western United States, and the identity of their flora with that of Mackenzie River and Greenland, and it is very satisfactory to find that Mr. Gardner has independently arrived at similar conclusions with respect to the Eocene of Great Britain.

An important consequence arising from this is that the period of warm climate which enabled a temperate flora to exist in Greenland was that of the later Cretaceous and early Eocene, rather than, as usually stated, the Miocene. It is also a question admitting of discussion, whether the Eocene flora of latitudes so different as those of Greenland, Mackenzie River, North-West Canada, and the Western States, were strictly contemporaneous, or successive within a long geological period in which climatal changes were gradually proceeding. The latter statement must apply at least to the beginning and close of the period ; but the plants themselves have something to say in favour of contemporaneity. The flora of the Laramie is not a tropical but a temperate flora, showing no doubt that a much more equable climate prevailed in the more northern parts of America than at present. But this equability of climate implies the possibility of a great geographical range on the part of plants. Thus it is quite possible, and indeed highly probable, that in the Laramie age a somewhat uniform flora extended from the Arctic seas through the great central plateau of America far to the south, and in like manner along the western coast of Europe. It is also to be observed that, as Gardner points out, there are some differences indicating a diversity of climate between Greenland and England, and even between Scotland and Ireland and the south of England ; and we have similar differences, though not strongly marked, between the Laramie of Northern Canada and that of the United States. When all our beds of this age, from the Arctic Sea to the 49th parallel, have been ransacked for plants, and when the palæobotanists of the United States shall have succeeded in unravelling the confusion which now exists between their Laramie and the Middle Tertiary, the geologist of the future will be able to restore with much certainty the distribution of the vast forests which in the early Eocene covered the now bare plains of interior America. Further, since the break which in Western Europe separates the flora of the Cretaceous from that of the Eocene does not exist in America, it will then be possible to trace the succession of plants all the way from the Mesozoic Flora of the Queen Charlotte Islands and the Kootanie series, described in previous papers in these Transactions, up to the close of the Eocene ; and to determine, for America at least, the manner and conditions under which the angiospermous flora of the later Cretaceous succeeded to the pines and cycads which characterized the beginning of the Cretaceous period.

THE LIVERPOOL MARINE BIOLOGY STATION ON PUFFIN ISLAND.

THE Liverpool Marine Biology Committee was formed in the spring of 1885 for the purpose of working up thoroughly the fauna and flora of that large rectangular area of the Irish Sea which lies around Liverpool Bay, and is bounded by the Isle of Man and the coasts of Anglesey, North Wales, Cheshire, and Lancashire. During the last three seasons the members of the Committee have conducted a large number of dredging, tow-netting, and other investigating expeditions in various parts of the Liverpool Marine Biology Committee district, and, as a first result of their labours, they published, in the summer of 1886, a " First Report upon the Fauna of Liverpool Bay and the Neighbouring Seas." It became evident at an early stage in these investigations that, as the sand-banks and channels in the immediate neighbourhood of the estuary of the Mersey are comparatively barren, it would be necessary, in order to carry on the work of the Committee satisfactorily, to establish a small marine laboratory somewhere on the coast of North Wales or Anglesey. Such a station, close to the region where there is a rich and varied fauna, and yet within easy reach of Liverpool, would enable the members of the Committee, and other biologists who were working with them, to pay frequent and regular visits to the best ground for the purpose of collecting specimens ; and also to carry on observations on the habits of the animals, and to investigate their structures and life-histories. The Liverpool Marine Biology Committee have been aided in their work by small grants this year and last year from the Government Grant Committee of the Royal Society, and have received most important and generous assistance, by the loan of steamers for the dredging expeditions and in other ways, from some of the Liverpool ship-owners—amongst others, from the present Mayor, Sir James Poole, from Mr.


Biological Station.
Old Tower.

George Holt, and from the Liverpool Salvage Association—and now they owe the attainment of their desire for a marine laboratory to the kindness of Sir Richard Williams Bulkeley, Bart., of Beaumaris, in allowing them to make use, for scientific purposes, of the former Dock Board Telegraph Station on Puffin Island (Fig. 1).

Puffin Island, or Priestholme, is a small uninhabited island close to the north-east corner of Anglesey, and lying with its longer axis north-east and south-west. It is composed mainly of beds of limestone, and has precipitous sides, which have been worn into caves, crevices, and innumerable pools. The best landing-place is on the end nearest to Anglesey, where there is a beach of shingle. The shores all round the island support an abundant fauna, and some of the best dredging-grounds in the Liverpool Bay district lie close to Puffin Island, and a little further to the west along the coast of Anglesey. A glance at the accompanying chart will show the diversity in the depth of water off the north and east ends of the island (Fig. 2).

The house which the Liverpool Marine Biology Committee have now taken possession of as a centre for their further operations was built by the Liverpool Dock Board, and used as a signalling station, but has been uninhabited for some years. It contains four good rooms, besides lofts and out-houses, and a long observatory running towards the sea (north-east), and lighted by a series of seven windows round the outer end (Fig. 3). This observatory will make a well-lighted, convenient laboratory, while the other four rooms serve as kitchen and sleeping rooms for the naturalists and the keeper of the station.

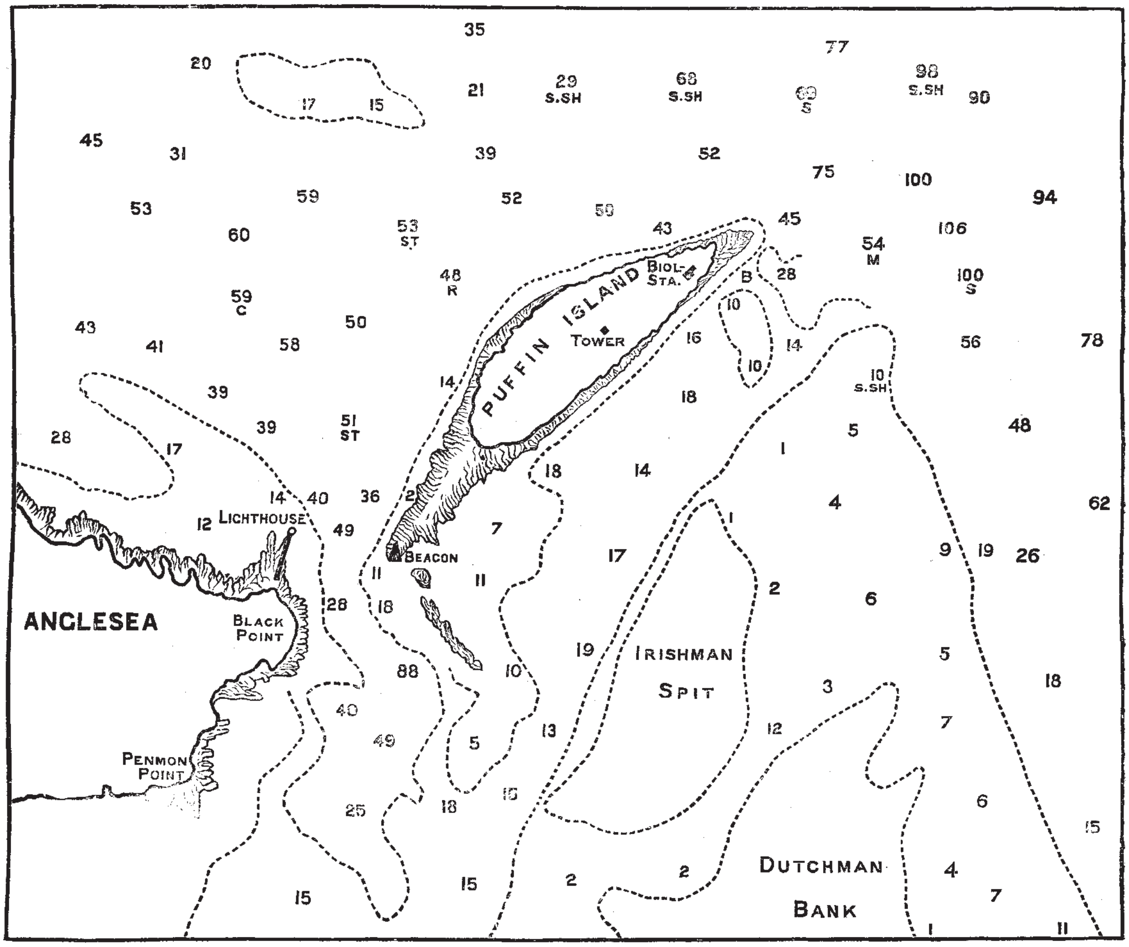


FIG. 2.

At the end of May the new doors and windows, shutters, tables, and other fittings, which had been prepared in Liverpool, were ready for transference to the station, and a number of the Liverpool Marine Biology Committee, along with some workmen, were taken down to Puffin Island by the ss. *Hyæna*, which had been lent for the purpose by the Liverpool Salvage Association. The house was rapidly made weather-tight and put in working order, and is now under the charge of a keeper and his assistant. Tanks will soon be erected, and some of the shore-pools are being converted into natural aquaria. A small sailing-boat has been obtained, by which dredging and tow-netting in the neighbourhood of the island can be carried on, and by means of which communication can be kept up with the Liverpool steamers at Beaumaris and the railway at Bangor.

Since the establishment of the station some of the members of the Liverpool Marine Biology Committee have already had half a dozen expeditions to the island, and the following naturalists have commenced work on their respective groups of animals: Mr. I. C. Thompson, on the Copepoda; Mr. J. Lomas, on the Polyzoa; and Prof. Herdman, on the Tunicata. Various other scientific men have come as visitors to see the station, including: Prof. Lodge, F.R.S., Prof. Hele Shaw, Mr. Reginald Phillips, of Bangor, Mr. I. Roberts, and Mr. Mellard Reade; and it is hoped that if the weather is favourable on Sept. 3, the biologists taking part in the British Association dredging expedition, arranged by the Liverpool Marine Biology Committee, will have an opportunity of visiting Puffin Island and its Biological Station. W. A. HERDMAN.

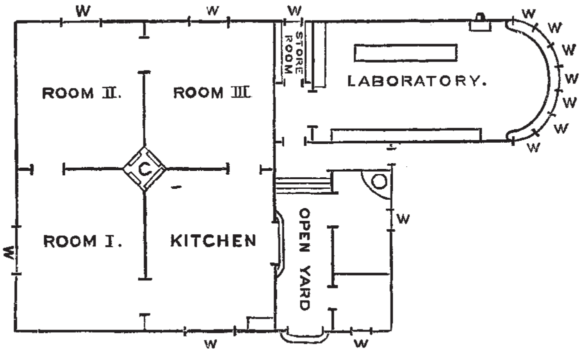


FIG. 3.—Plan of Liverpool Marine Biological Station on Puffin Island. w, windows; c, chimneys.

ANTARCTIC EXPLORATION.

IN June 1886, an Australian Antarctic Exploration Committee was appointed at Melbourne. It consisted of five members each from the Royal Society of Victoria and the Royal Geographical Society, Victoria Branch. This Committee has collected a quantity of information respecting the islands lying south of Tasmania as well as respecting lands lying nearer the Pole.

The prospect of obtaining a Government grant for an expedition having scientific purposes only, though the preferable course, was thought to be hopeless. The Committee therefore has recommended the Government of Victoria (which had expressed itself favourably to the project) to offer to steam-whalers, for carrying a scientific staff to certain high latitudes, bonuses, graduated to degrees of southing. We print the conditions, but no tenders can be invited till a grant is assured, and the Government of Victoria is indisposed to act in the matter without other colonies, whose co-operation is doubtful, though Tasmania will most probably offer a small contribution.

Many offers of steam-whalers have been sent from England, Scotland, and Norway, where the owners seem anxious to dispose of their ships and gear. Most important and valuable information and advice have been received from Capt. Gray, of Peterhead.

The following are the recommendations of the Antarctic Committee to the Honourable the Premier of Victoria:—

(1) The Antarctic Committee begs respectfully to recommend to the Honourable the Premier the propriety of stimulating Antarctic research by the offer of bonuses.

(2) That a sum of £10,000 be placed upon the Estimates, to provide for the amount of the bonuses, and for the expenses of the equipment and of the staff.

(3) The amount of the bonuses to be paid to the shipowners for the hereinafter mentioned services is to be decided by tender, and the same, together with the cost of equipment and the staff, not to exceed the sum of £10,000.

(4) That the Government invite tenders from shipowners willing to perform the services required.

(5) That the tenders be sent to the Treasury direct, or through the Agent-General, not later than June 1.

(6) That tenderers must provide two fortified steamships, each of not less than 175 tons register, 60 horsepower nominal, and A1 at Lloyd's, or of an equivalent class.

(7) That tenderers must supply full descriptions of the ships and their equipments.

(8) That the master and chief mate of both ships shall have held similar positions in Arctic steam-ships.

(9) That the tenderer shall provide, free of charge, cabin accommodation in each ship for two gentlemen, who will sail as the scientific staff; also a separate cabin, of a size to be specified, as instrument-room and office.

(10) The scientific staff will have the status of cabin passengers, and be subordinate to the master, but the master must afford them every facility, that does not interfere with the work or safety of the ship, for noting natural phenomena.

(11) The chartered ships will earn a special bonus (to come out of the £10,000 appropriated) upon their entering at the Custom House a cargo of 100 tons of oil, being the produce of fish caught south of 60° S. The special bonus to be paid as follows, viz.:—To ships owned and registered in Australia, £1,000; to ships owned and registered elsewhere, £800.

(12) The services desired are as follows, viz.:—A flying survey of any coast-lines lying within the Antarctic Circle, and not now laid down upon the Admiralty charts. The discovery of new waterways leading towards the South Pole, and of harbours suitable for wintering in. Opportunities to be afforded to the scientific staff to add to our knowledge of the meteorology, oceanography, terrestrial magnetism, natural history, and geology of the region. The discovery of commercial products.

(13) The tenderer must specify the bonus he demands for passing 70° S. with either one or two ships; also the bonus he demands for each degree attained beyond 70° S. by one ship; also the bonus he demands for every occasion upon which he succeeds in establishing on the shore a temporary observing camp.

(14) That the Government should pay for only one such station for each 120 miles of latitude or longitude, unless the master shall have established more at the written request of both members of the staff.

(15) The staff to have the right to refuse to accept the site of any camp selected by the master, and such refusal shall be logged by the master, and read over to the staff in the presence of the mate and the surgeon; and the staff shall hand to the master their objections thereto in writing, and the same must be signed by both of them.

(16) The tenderer will not receive any more bonus for two ships than for one after passing the 70th parallel. The Committee would prefer that one of the ships should remain fishing in the neighbourhood of North Cape, Victoria Land, whilst the other pushed into higher latitudes. In case of accident to the latter, the former would serve as a depot and relief for the shipwrecked crew to fall back upon.

(17) Should the master of either ship despatch an exploring party from his vessel, the contractor will be entitled to a bonus for each sixty miles of latitude or longitude traversed by such party, but the tenderer must specify what sum he will require for each sixty miles so traversed.

(18) That the ships should proceed direct to the bight situated on the meridian of 180°, with a view of one of them getting beyond Ross's furthest, and especially of observing the conditions of the volcanoes at the head of the bight.

(19) The contractor will be liable to no penalty should he fail to reach to any latitude tendered for.